Lecture Module - Data Acquisition

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 1 - Analog to Digitial Conversion

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- DAQ and Computer Storage
- Types of Integers
- Integers vs. Floating Point Numbers
- Analog to Digital Conversion
- Activity: ADC Resolution Calculation

DAQ and Computer Storage

A data acquisition system is the portion of a measurement system that quantifies and stores data. - Theory and Design of Mechanical Measurements

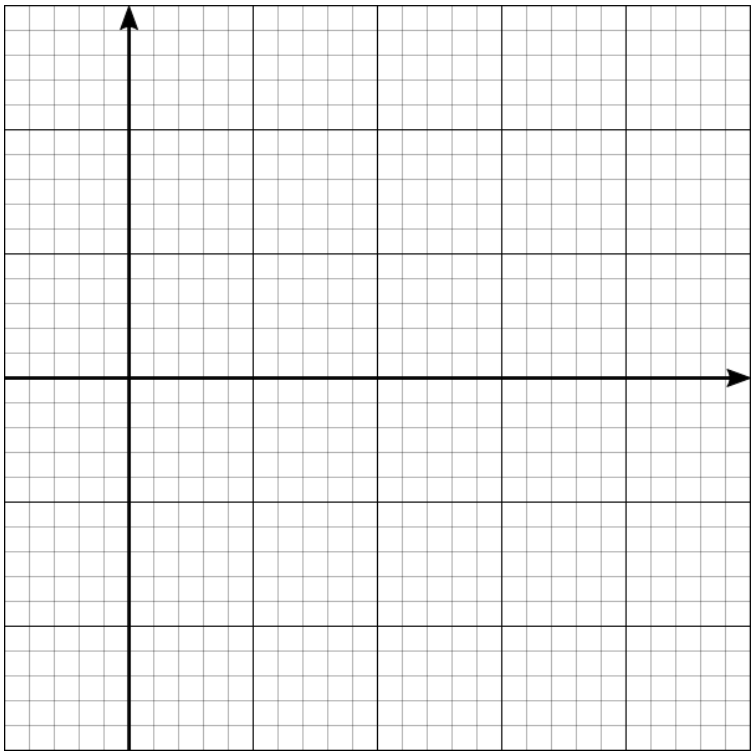

Image: T.Hill

Types of Integers

Binary	Decimal	Hexadecimal
0	0	0
1	1	1
10	2	2
11	3	3
100	4	4
	5	5
	6	6
	7	7
	8	8
	9	9
	10	A
	11	B

Binary	Decimal	Hexadecimal
	12	C
	13	D
	14	E
	15	F
	16	
	17	
	18	
	19	
	20	
	21	
	22	
	23	

some reference

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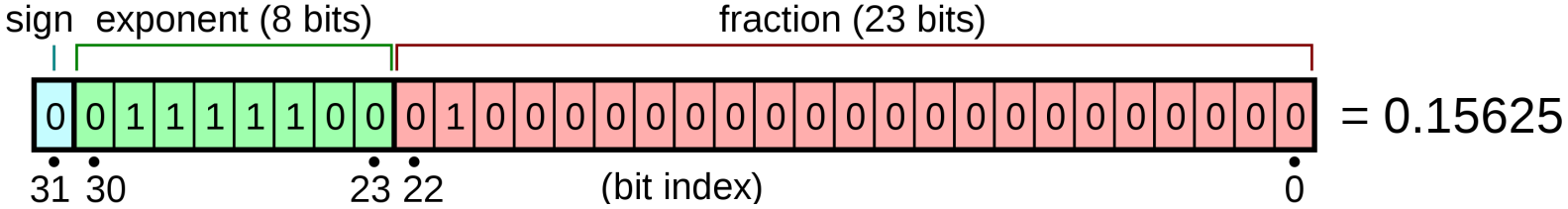
Integers vs. Floating Point Numbers

Standard definition of a floating point value in memory.



Reference: wikipedia

Integers vs. Floating Point Numbers

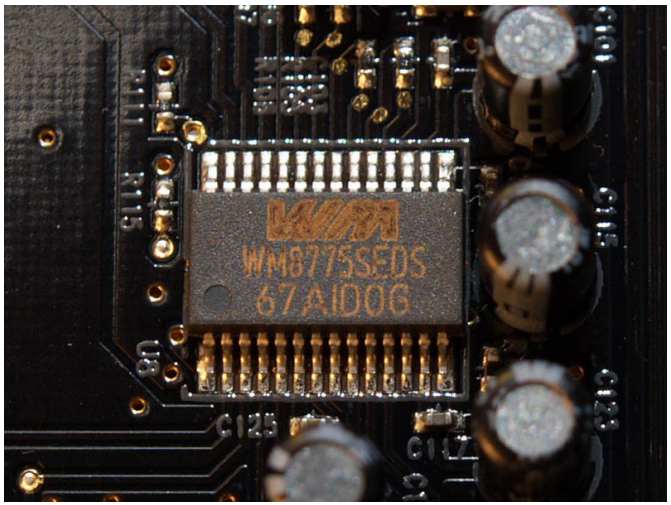
Integer	Floating Point

Integers vs. Floating Point Numbers

Integer	Floating Point
Pros:	Pros:
Cons:	Cons:

Analog to Digital Conversion

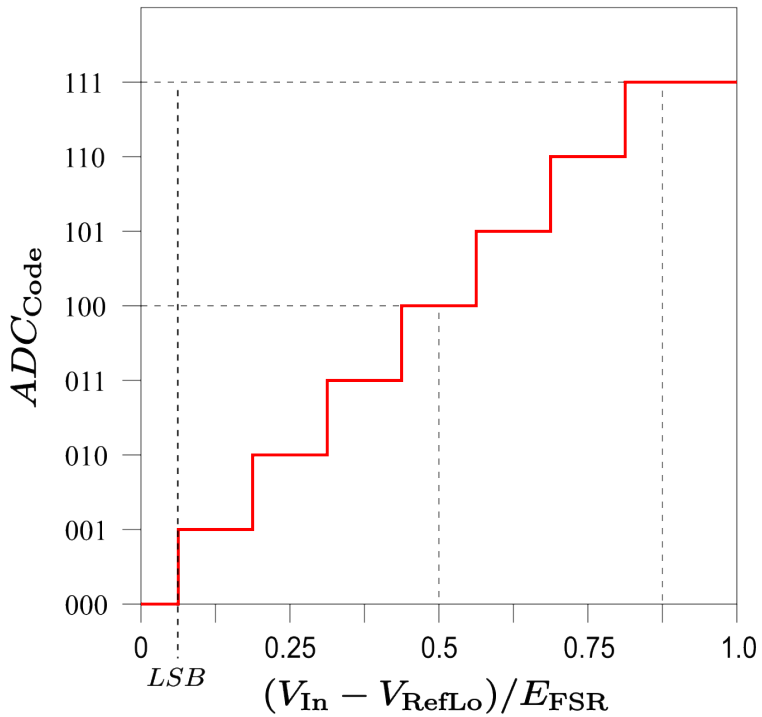
In electronics, an analog-to-digital converter (ADC, A/D, or A-to-D) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as an electronic device that converts an analog input voltage or current to a digital number representing the magnitude of the voltage or current. Typically the digital output is a two's complement binary number that is proportional to the input, but there are other possibilities.



wikipedia, image

Analog to Digital Conversion

It is important to realize the potential for data loss resulting in a reduced quality measurement based on the parameters of the analog to digital conversion process. This issue can occur when designing systems around a low-level analog to digital converter as well as when using high-end DAQ equippment.



Activity: ADC Resolution Calculation

some reference